

# ABSTRACT

A method and apparatus implementing a user interface device, such as a mouse or trackball, having electronically controllable tactile responsiveness which is flexibly programmable. A user interface device effects positioning of a cursor within a limited area, such as on a display screen, with limits imposed by controllable tactile responsiveness. Programmable force-position characteristics relate the tactile responsiveness of the interface device to the position of the cursor within the limited area or on the display screen. In a described embodiment, the interface device includes at least two sets of wheels that move as the interface device is actuated. The at least two sets of wheels are aligned on mutually orthogonal axes. A servo motor is attached to each of the at least two sets of wheels. A position encoder is associated with each servo motor and outputs position information to a controller that has access to force-position relation information that is a function of a screen display on which the cursor is manipulated. The controller outputs a digital signal, in accordance with the force-display position relation information. The digital signal is converted to an analog current signal applied to the servo motor(s) to generate force in the servo motor. The force, presenting a tactile response to a human interacting with the user interface device, is perceived as a resistance, tactile pressure or lack thereof, or as a positive, assisted motion which is indicative of position on a screen display.